

THERMAL TEST FACILITY (TTF)

USER'S MANUAL

<http://microgravity.grc.nasa.gov/thermalchambers/>

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1. Purpose

This document provides a prospective user of the Thermal Test Facility with its capabilities and with general guidelines which should be followed to ensure a successful test program. Any questions pertaining to this document should be directed to Spencer Myer, (216) 433-2659, Glenn Research Center.

2. Facility Description

The TTF is located in Building 333 Annex, on the east end of the east wing facing the large freight entrance door. The area is equipped with a 2 ton crane. The TTF consists of two separate environmental chambers, each with its own control/data acquisition system (C/DAS). Each C/DAS is used to program and control its chamber and can be used to take data from the experiment package. In case of a problem, each chamber can also be controlled using its programmable controller.

Mechanical facility systems:

- City water

Available electrical facility systems:

- 480VAC, 3 phase
- 208VAC, 3 phase
- 110VAC, 1 phase
- UPS 110VAC 1 phase
- Building ground
- Instrument ground
- Equipment ground

The adjacent building (building 333) has a shop with basic equipment such as a lathe, brake, drill press, milling machine, table saw, grinders, and a band saw. This equipment must be used by building TID personnel only.

This manual and much more information are available at the TTF web site at:

<http://microgravity.grc.nasa.gov/thermalchambers/>

2. TTF Capabilities

3.1 Environmental Chambers

Small Chamber

- Testing volume $0.56\text{m}^3 = 0.8\text{m}_D \times 0.76\text{m}_W \times 0.91\text{m}_H = 31.5''_D \times 30''_W \times 36''_H$
- Temperature range of -73°C to $200^\circ\text{C} = -99^\circ\text{F}$ to 392°F

- Relative humidity range of 20% to 95% as limited by an 85°C(185°F) dry bulb temperature and a 4.4°C(40°F) dew point.
- Access port: 6" port

Large Chamber

- Testing volume $3.1\text{m}^3 = 1.2\text{m}_D \times 1.35\text{m}_W \times 1.8\text{m}_H = 48''_D \times 54''_W \times 72''_H$
- Temperature range of -73°C to $176^\circ\text{C} = -99^\circ\text{F}$ to 349°F
- Relative humidity range of 20% to 95% as limited by a 85°C(185°F) dry bulb temperature and a 4.4°C(40°F) dew point.
- Maximum floor loading $239\text{ON}/\text{m}^2$ (50lbs/ft²).
- Access ports: seven 4" ports

3.2 Control/Data Acquisition System

Each chamber has its own C/DAS system. The C/DAS utilizes a Hewlett-Packard data taker as the front end and a 486 PC serves as the user interface. A laser printer is also available at each chamber. The user can program chamber temperature and humidity profiles into the system. Shutdown criteria and other requirements can be programmed using a series of user-friendly screens. The system records data from the chamber and is also capable of taking data from the user's hardware as listed below:

System capabilities/parameters:

- 124 Data channels (thermocouples, voltages, currents)
- 12 Control outputs
- Data scan rate of 1/second
- 200 Megabytes of storage

The user can also control the chamber "manually" using a screen to enter the desired temperature and/or humidity.

4. User Procedures

4.1 Generic Test Summary

This facility is a "semi-self-service" facility. The user is responsible for setting up the experiment. Once the test is set up the user is responsible for conducting the test. 6727 will provide training as required to assist the user in operating the test. Members of 6727 will act as supervisors assuring that procedures are understood and that the facility is configured correctly. The user is the test operator. Following is a scenario, in a summary form, of how a test would occur.

1. The user schedules the use of the facility and submits a data package (described later in this document) to Spencer Myer.

2. Spencer Myer evaluates the request and determines if any facility changes are required. If facility modifications are required Spencer Myer will provide the user with a cost and schedule for the modifications to the facility. 6727 will make the changes thereby maintaining configuration control. The cost associated with any modifications and returning the facility back to it's original configuration will be charged to the user.
3. 6727 will determine if the scope of the testing is within the bounds of the Safety Permit. If it is not, 6727 will contact the committee to request a modification to the permit.
4. If the user is unfamiliar with the facility 6727 will train the user on how to operate the facility (program in the thermal cycles, turn equipment on/off, safety precautions, etc.).
5. The user will be responsible for installing the test article and support equipment, and programming of the test through the user menus.
6. A test readiness review will be conducted in which 6742 and the test supervisor, will review the test setup to make sure everything is installed and programmed correctly and that nothing violates the safety permit.
7. Upon a successful test readiness review the test may be initiated and monitored by the user. 6727 will assist on facility matters, if necessary, during the test.
8. If any problems with the facility occur during the test 6727 will be responsible for resolving the problems.
9. Upon completion of the test it will be the user's responsibility to have the test article and any support equipment removed. Any equipment not removed will be excessed or thrown away.

All task orders to TID should be directed to Wendell White who is the TID supervisor. Task orders should be submitted as far ahead of time as possible in order for TID to plan it's man power usage. If, during installation, the test set-up is been modified from the original plan it should be brought to the attention of Spencer Myer as early as possible.

4.2 Scheduling the TTF

The user should submit the application form and accompanying documentation to Spencer Myer as far as possible in advance for planning purposes, to assure the user of the preferred time slot, and especially if some facility modifications are required to support the test.

This lead time is also required so that the proposed test can be reviewed to ensure compliance with the safety permit. If compliance is not found, 6727 will contact the area 7 safety committee to request modification of the permit, but modification cannot be guaranteed.

We will also use this lead time to determine if any facility modifications are required. All facility modifications shall be approved by the 6727. If it is determined that modifications are required the requester will be notified of what changes are required, the cost of the changes, and the time it will take to make the changes. The user is responsible for paying for the modifications and for returning the facility to it's original configuration. 6727 will insure that the modifications are performed.

The user must submit the application form (Appendix 1) to Spencer Myer (mail:MS333-1, email:Spencer.S.Myer@grc.nasa.gov). This form is also available on the TTF web site at <http://microgravity.grc.nasa.gov/thermalchambers/>.

A hazard analysis specific to the experiment should be conducted. It should look at the test hardware along with the test support equipment and the test plan to see what possible hazards could occur that are unique to the test. The complexity of this analysis will vary with the test hardware/set-up. Some simple tests, such as thermal cycling of powered down circuit boards in a chamber, will not require a hazard analysis. If you are unsure if a hazard analysis should be conducted please contact Spencer Myer at (216) 433-2659. A general hazards analysis for the TTF has already been completed.

Appendix 1

List of Thermal Test Facility Contacts

| <u>Responsibility</u> | <u>Person</u> | <u>Phone</u> |
|--|----------------------|---|
| Facility Technical/Operational/Scheduler | Spencer Myer | (216) 433-2659 pager: (216) 549-2135 |
| Facility Technical/Operational (Alternate) | Frank Gati | (216) 433-2655 |
| TID Supervisor/Building Manager | Robert Vanek | (216) 433-2698 |
| Facility Manager | Jim Mullins | (216) 433-8322 |

Appendix 2

Application Form

To help me process your request to use the Thermal Test Facility, please fill out the following form and return it to me (mail:MS333-1, email:Spencer.S.Myer@grc.nasa.gov). Also, could you provide me with a test plan, a hazards analysis (if the test set-up is complex), and a basic schematic of your equipment showing electrical and mechanical components and values (volts, pressure, etc.), connections, plumbing, and anything else which may be of interest. Please outline on the drawing which parts will be inside the chamber and which will be outside.

----- PLEASE ENTER THE FOLLOWING -----

- Contact Person:
- Phone:
- E-mail:
- Org Code:
- JO# (ex. Y0Fxxxx):
- Project name:
- Project acronym (if any):

----- PLEASE TYPE X AFTER EACH SERVICE THAT WILL BE REQUIRED -----

- Small Chamber
- Large Chamber
- Control/Data Acquisition System
- 110 VAC
- 208 VAC
- Uninterruptable Power Supply
- Other (explain):

**----- PLEASE PROVIDE A SHORT DESCRIPTION OF THE TEST HARDWARE AND USER-
PROVIDED EQUIPMENT -----**

----- CONCERNS RELATED TO OUR SAFETY PERMIT.

PLEASE ANSWER THE FOLLOWING AND EXPLAIN IF NECESSARY. -----

- Does the hardware which will be inside the chamber contain anything other than electronic systems and components? Explain if yes.

- Will voltages greater than 50 volts be inside the chamber? Explain if yes.

- Are any hazardous materials involved? Explain if yes.

- Does the test article contain any sealed or gas-charged vessels? Explain if yes.

----- PLEASE ENTER DESIRED SCHEDULE -----

Test Start Date:

Test End Date:

Estimated Test Setup Time:

Estimated Test Time:

Estimated Test Teardown Time:

Thank you for your help.

Spencer Myer